UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/823,837	03/30/2001	Gary Stephen Smith	20206-26 (P00-3352)	6115

			EXAMINER
25696	7590	03/30/2004	BANANKHAH, MAJID A

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ART UNIT	PAPER NUMBER
2127	6

DATE MAILED: 03/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on _30 March 2001_.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) _1-8_ is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) _1-8_ is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a) ☐ All　b) ☐ Some * c) ☐ None of:

　　　1. ☐ Certified copies of the priority documents have been received.

　　　2. ☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to application filed on March 30, 2001. Claims 1-8 are considered for examination.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Courtright, II et al.

(U.S. Pat. No. 6,157,963, hereinafter Courtright) in view of Huebenr et al. (U.S. Pat., No.

6,438,629, hereinafter Huebner).

Per claim 1, Courtright teaches a method of scheduling in a mixed workload environment on a computing system having a CPU resource and a permanent storage resource, the computing system servicing requests from one or more clients (col. 2, lines 21-28, *Preferably, the processing means is configured to receive I/O requests from the clients via the first interface means, prioritize and schedule the I/O requests in accordance with a priority algorithm, and conduct an I/O operation with the storage objects via the second interface means for an I/O request having a preselected priority. After the I/O operation is complete, the processor communicates the results back to the client that initiated the I/O requests.*),
comprising: executing a current process on the CPU resource and the storage resource (col. 2, lines 56-66, *The present invention is a method and apparatus for receiving, prioritizing, scheduling and processing I/O requests from a plurality of storage users or clients to one or more storage objects, where each storage object preferably is under the control of a central storage controller*),
the current process having been dispatched to service a current client request (col. 5, lines 13-21, *processor 24 then processes the I/O operation for the selected I/O request with the appropriate storage object(s) 20, and returns the results of the I/O operation back to the requesting storage user 12 (Block 56)*);
The reference of Courtright teaches of changing priority assignment to the requests and changing priority for contention resolution (col. 1, lines 45-51, *In addition, the disk storage interfaces currently known in the art do not have means for resolving contention issues between users, so if one user submits a plurality of I/O requests at one time, requests from other users can become blocked behind the I/O requests of that one user. Thus, higher priority I/O requests can be starved of resources and undesirably delayed*, and col. 5, lines 21-38, *In accordance with one*

aspect of the present invention, after processor 24 executes an I/O operation from one of the memory queues 32, processor 24 preferably changes the priority value assigned to that memory queue 32 (Block 58). By changing the priority value of memory queue 32 after an I/O request has been processed from that queue, processor 24, and in particular the prioritizing and scheduling algorithm used by processor 24, ensures that I/O requests placed in queues with lower initial priorities eventually get processed. If the priority values are not adjusted, one or a small number of relatively high priority queues may consume substantially all of the processing resources, preventing I/O requests in other lower priority queues from being processed. In addition, as discussed in more detail below, processor 24 periodically may perform a decay function on all the memory queues, changing the priority of all the queues in accordance with a predetermined decay function algorithm); but fails to explicitly teaches of teach of
performing a contention check while executing the current process to determine whether a new client request has a transaction priority that is greater than the transaction priority of the current client request if the transaction priority of the new client request is greater than that of the current request, dispatching a process to service the new client request;

if the transaction priority of the new request is not greater than that of the current request, determining whether the transaction priority of the current request is less than a predetermined threshold priority;
if the transaction priority of the current client request is lower than the predetermined threshold priority and there is higher priority 1/0 activity present on the storage resource: delaying the servicing often current client request and forgoing the servicing of any read ahead for the current client request;
and dispatching a process to service the highest priority client request that is available for service;
However, the reference of Heubner teaches of a system, a hard disk buffer arbitration subsystem is provided which responds to client request to provide, to a microprocessor or micro controller, disk input/output processes, and hard disk control processes, and the buffer channel access controller which comprises a priority based arbitrator which assigns to an access request from the given client a default priority when the threshold delay has not been reached by the counter, and a higher priority when the threshold delay has been reached by the counter. The priority-based arbitrator may comprise a fixed-priority encoder (See, col. 2, lines 13-21, and col. 3, lines 12-27, and lines 61-68), for the reason that contentious demands on disk buffer's (resource) channel which has limited data transfer rate the client does not wait for a unlimited long time when there are fixed priority requests are assigned to requests (See, col. 1, lines 57-68, continued on col. 2, lines 1-8). Therefore, it would have been obvious for one ordinary skill in the art at the time the invention was made to incorporate the latency monitor system wherein there is provided a priority based arbitrator which assigns to an access request from the given clients a default priority when the threshold delay has not been reached by the counter and a higher priority when the threshold delay has been reached by the counter (See, col. 4, lines 12-27).

and if the transaction priority of the current client request is greater than the predetermined threshold or the priority of the current client request is lower than the predetermined threshold and there is no higher priority 1/0 activity present on the storage resource (col.3, lines 29-35, *The*

request communicator couples requestors to the buffer access determining mechanism. The requestors request the buffer access determining mechanism to give clients access to the buffer channel. When they are given access to the buffer channel, the clients write data to or read data from the buffer via the buffer channel. The disk input/output subsystem exchanges data between the buffer and the storage media):
determining whether the current client request requires any read ahead;
dispatching one or more helper processes to service any required read ahead;
and returning to the current process to service the current client request (col.6, lines 27-31, and col. 8, lines 4-7, *Disk I/O interface 42 handles reads from and writes to the disk media. Disk I/O interface 42 stores disk data, read from the disk media, in memory buffer 32.*
, and *Requestor signal F pertains to disk data to be read from the disk media and stored in memory buffer 32, and corresponds to an access request made by disk I/O interface 42 via arbitration request line 46d).*

Per claim 2, 4, 5, and 7, since the maximum priority, minimum priority, the amount of fixed delay does not change the steps recited in the method, therefore, do not provide a patentably distinct limitation therefore, setting priorities are obvious for the reason that priority limitations could be assigned by the user before setting the program for execution.

Per claim 3, wherein the step of delaying the servicing of the current client request includes delaying the servicing of the current client request by an amount of time that depends on the transaction priority of the current client request, higher priority requests being delayed less than lower priority requests, and the amount of the delay being the sum of a fixed delay and a priority dependent delay (See, Huebner, col. 3, lines 5-12, *The buffer channel access controller may comprise a priority based arbitrator which assigns to an access request from the given client a default priority when the threshold delay has not been reached by the counter, and a higher priority when the threshold delay has been reached by the counter. The priority-based arbitrator may comprise a fixed-priority encoder, and* See, Huebner, col. 4, lines 12-27, *The latency monitor may comprise a setting register, a counter, and a high latency signaler. The setting register holds a value representing a threshold delay in granting a given client access to the buffer. The counter counts an amount of time elapsing from a reset time--e.g. a time at which a buffer access request was last granted to the given client. The high latency signaler signals to the buffer access controller when the threshold delay has been reached by the counter. The setting register may be software programmable. The buffer channel access controller may comprise a priority-based arbitrator, which assigns to an access request from the given client a default priority when the threshold delay has not been reached by the counter and a higher priority when the threshold delay has been reached by the counter. The priority-based arbitrator may comprise a fixed- priority encoder).*

Per claim 6, wherein the step of delaying the servicing of the Current client request includes delaying the servicing by a fixed delay (See, Huebner, col. 3, lines 5-12, *The buffer channel access controller may comprise a priority based arbitrator which assigns to an access request*

from the given client a default priority when the threshold delay has not been reached by the counter, and a higher priority when the threshold delay has been reached by the counter. The priority-based arbitrator may comprise a fixed-priority encoder).

Per claim 8, wherein the step of performing a contention check occurs once every time a physical block is transferred from the storage resource (See Courtright, col. 5, lines 1-12, *In accordance with one embodiment of the present invention, memory 28 will comprise one memory queue 32 for each storage user 12. In this manner, I/O requests from a specific storage user 12 will be placed in a specific memory queue 32 associated with that storage user. However, as one skilled in the art will appreciate, other storage user/memory queue associations may be used. For example, if two or more storage users 12 have the same or similar priority values, I/O request from those storage users may be placed in a single memory queue 32 configured to receive I/O requests from all storage users 12 having a particular priority or a priority value falling within a particular range).*

4.The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Majid A. Banankhah** whose voice telephone number is **(703) 308-6903**. A voice mail service is also available at this number.

All response sent to U.S. Mail should be mailed to:
Commissioner of Patent and Trademarks
Washington, D.C. 20231

Hand-delivered responses should be brought to Crystal Park Two, 2021 Crystal Drive, Arlington. VA, Six Floor (Receptionist). All hand-delivered responses will be handled and entered by the docketing personnel. Please do not hand deliver responses to the Examiner.

All Formal or Official Faxes must be signed and sent to either (703) 308-9051 or (703) 308-9052. Official faxes will be handled and entered by the docketing personnel. The date of entry will correspond to the actual FAX reception date unless that date is a Saturday, Sunday, or a Federal Holiday within the District of Columbia, in which case the official date of receipt will be the next business day. The application file will be promptly forwarded to the Examiner unless the application file must be sent to another area of the office, e.g., Finance Division for fee charging, etc.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is **(703) 305-9600**.

Majid Banankhah

3/22/04

MAJID BANANKHAH
PRIMARY EXAMINER